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by

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In the study of meteorite substances, the collection and investigation of meteor dust is also extremely important. As is well known, along with the fallout of meteor dust, industrial dust, apparently closer to fuel and metal ash than anything else in mineral composition and structure, falls out in greater quantity and almost everywhere on the earth. Therefore, in order to differentiate meteor dust from industrial dust, it is first of all necessary to know the minerals and structure of residues well and particularly pay attention to the nontransparent minerals.

What is meteor dust and what sort of structure and mineral composition does it have? A correct formulation of the question in the study of meteor dust was presented by E. L. Krinov (1). During exacting investigation of the melting crust of iron and stony meteorites, he established that meteor dust must basically match the melting crust in structure and mineral content. Miniscule hardened atomized droplets of a silicate substance matching the melting crust were established by E. L. Krinov on the crustless surface of the stony meteorite Kunashak (2).

Besides this, meteor dust collected during the fall of the Sikhote-Alin meteorite was found in the soil (3).

Mineralographic investigations conducted by the author (4-7) showed that the melting crust of stony meteorites consists of two zones which differ sharply from each other both in mineral composition and in structure. The first, outer zone, 0.1 to 0.3 mm. thick consists of the melted silicates, partially crystalized, and nickelous iron and troilite fully move into it and secondary minerals, having formed magnomagnetite (?), which is in the form of miniscule isometric grains of dimension .05 to 2 microns. Its coefficient of light reflection R equals 13 to 15%. The structure of this zone is microporous and magnetic. A second, inner zone of the melting crust of the meteorite has a dense structure, the silicates in it are not subjected to melting and nickelous iron and troilite are remelted and form very thin fibers and spheres which are several microns in dimension. The width of these zones is also expressed in tenths of a millimeter.

The melting crust of iron meteorites also consists of two zones. The first, outer zone, is basically composed of oximagnite with a small content of iotsit (josetite ?) and occasional grains of nickelous iron; its thickness is 0.1 to 1 mm. and its structure is porous. The inner zone consists of nickelous iron with occasional droplet-formed grains of iotsit.

Therefore, the observation data testifies that meteor dust must basically be identical to the outer zone of the melting crust of metorites in its mineral composition and microstructure.

The major methods of research with which to differentiate meteor dust from industrial and also investigate it are mineralographic, spectral, X-ray defraction and microchemical. In the case of silicate meteor dust which has the greatest dispersion, its microstructure, nontransparent (ore) minerals and their quantitative content can be determined by the mineralographic method. Knowing the qualitative content of ore minerals and silicate meteor dust, the percentage composition of iron, nickel and cobalt can be determined through microchemical and spectral analyses and the meteoric origin of the dust under study can be confirmed with this.

In conclusion it should be stated that the establishment and study of meteoric dust seems possible on the basis of data from mineralographic and microchemical investigations of the outer zone of the melted crust of meteorites as well as from mineralographic investigations of fuel and metallic ashes.

Bibliography

[1] Krinov, E. L., "Structure of the Melting Crist of Sikhote-Alin Rain." Report of the USSR Academy of Sciences. 64 No. 4, 1949

[2] Krinov, E. L., "Stony Meteoritic Rain. Kunashak" Meteoritika. No. 8, 1950.

[3] Krinov, E. L., Fonton, S. S., "The Discovery of Meteor Dust on the Site of Sikhote-Alin Iron Meteoritic Rainfall." Report of the USSR Academy of Sciences 85, No. 6, 1952

[4] Kolomenskiy, V. D., "X-Ray Diffraction Research of the Melting Crust on the Stony Meteorite Kunashak," Meteoritika, No. 19, 1960.

[5] Kolomenskiy, V. D., Yudin, I. A., "Mineral Composition of the Melting Crust of the Meteorite Sikhote-Alin, and Also That of Meteor and Meteorite Dust," Meteoritika, No. 16, 1958.

[6] Yudin, I. A., "The Melting Crust of a Stony Meteorite Kunashak", Meteoritika, No 13, 1965

[7] Yudin, I. A., "On Finding Meteor Dust in an Area of Meteoritic Rainfall Kunashak," Meteoritika, No. 18, 1960